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T MAZE CAVE MANAGEMENT PLAN

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BUREAU OF LAND MANAGEMENT

SHOSHONE DISTRICT

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PREFACE

The T-Maze Management Area contains caves with unique and unusual speleologic features. This resource can provide excellent educational and recreational opportunities if managed for the natural historic values.

Vandalism has been the chief agent of deterioration. Demand for use of the caves as a recreational resource has increased. This management plan presents the long-term and short-term management actions which will protect the resource and enhance our knowledge about a valuable natural resource.

The actions proposed in this management plan will be implemented based upon the success of previous actions as reported in the annual report, and budget constraints. This allows flexibility in responding to effectiveness of management actions, changing conditions at the site, and management priorities.

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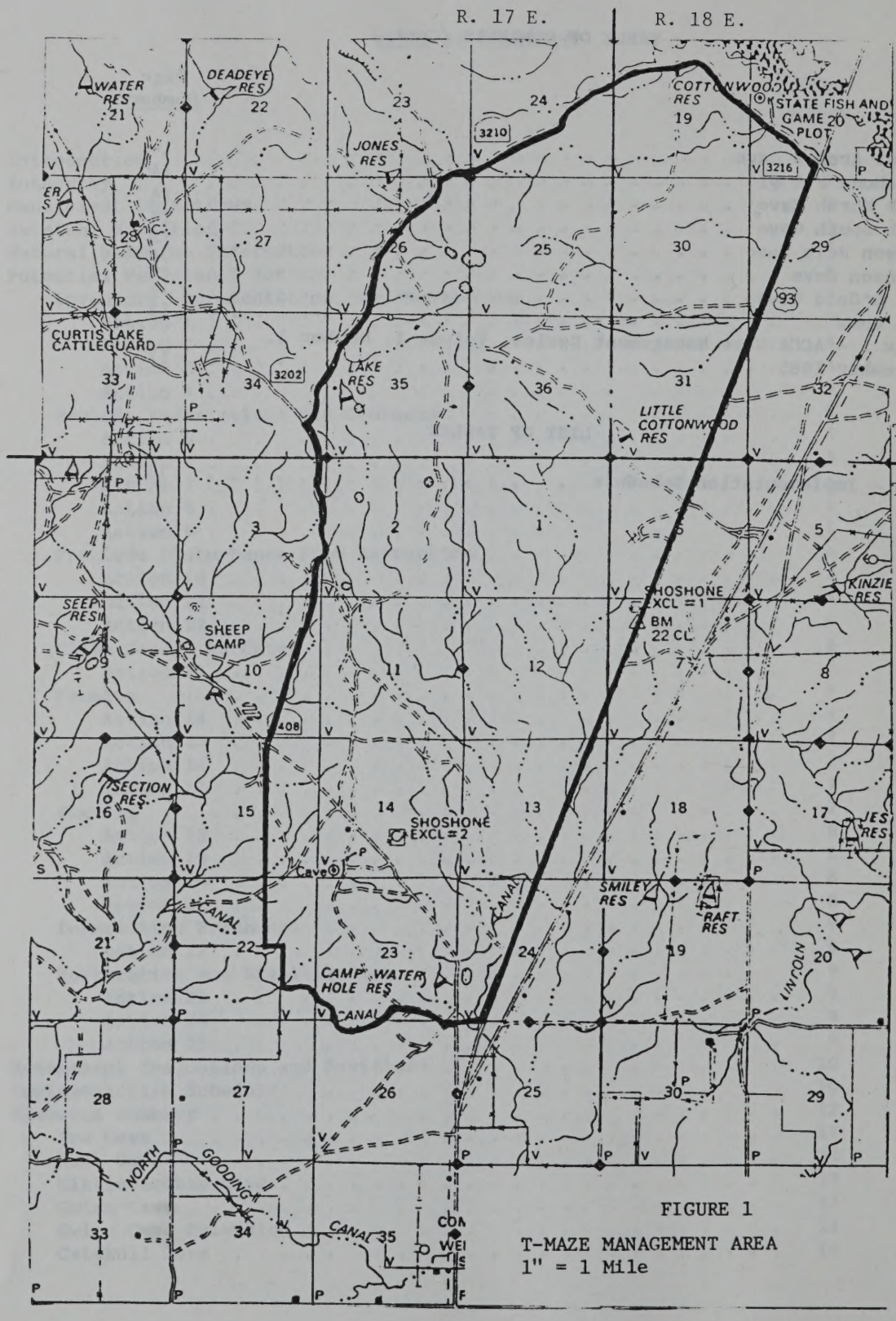

FIGURE 1

T-MAZE MANAGEMENT AREA
1" = 1 Mile

NATURAL HISTORY RESOURCE MANAGEMENT PLAN FOR THE T-MAZE MANAGEMENT AREA

INTRODUCTION

The T-Maze Management Area is in a basalt lava flow which contains numerous lava tube segments. This natural historic feature is significant in that the size, state of preservation, and presence of unusual speleological features are unequalled in Idaho and in most of the continental United States. Several of the well-known caves have received heavy use, however, most have had minimal use.

This plan will provide for the long- and short-term preservation and use of this natural historic resource.

AUTHORITY

The Federal Land Policy and Management Act of 1976 Section 102.a.8 states that it is the policy of the United States that "the public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resources and archaeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition...."

The National Environmental Policy act of 1969 states in Section 101.6.3 that it is the responsibility of the federal agency to "Preserve important historic, cultural and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice."

MANAGEMENT OBJECTIVES

The goal of this management plan is to provide for the short-term and long-term preservation and use of the cave resources in the T-Maze Management Area. Objectives to achieve this goal are: (1) protect and preserve the unusual features and forms of the cave resources, (2) provide for proper utilization at a level which does not prevent preservation, and (3) restore the resource where it has been impaired or a disturbed setting has resulted in hazardous conditions.

EXISTING SITUATION

The T-Maze Management Area is located in the Bennett Hills Resource Area, Bennett Hills Planning Unit, and the North Shoshone Grazing Allotment. The allotment management plan for this allotment was completed in 1969. There is one placer claim in the southwest quarter of Section 2, Township 4 South, Range 17 East, Boise Meridian. This is for ornamental rock.

The presence of caves in the T-Maze Management Area has been known for some time. The extent of the system of lava tubes, however, was not known

until 1977 when this area was explored by members of the Gem State Grotto, an amateur speleological organization. At that time, the significance of the caves became apparent as well as the discovery of several new caves. Until vandalism of several of the newly discovered caves became apparent, no special management requirements were needed to protect these resources. Only one cave, Pot O'Gold, is currently protected by a locked gate.

Vandalism and misuse account for all of the damage present in these caves. Most common damages include destruction of speleological features and painting graffiti in and outside the caves. Apparently, no resources have been damaged by surface activity, however, the potential exists. The Lincoln County Sheriff patrols the area under a cooperative agreement with the Bureau of Land Management (BLM).

Infrequent vehicle use within the proposed management area is primarily from ranch or farm vehicles and recreational uses during hunting season. Access to the area is gained via a BLM road through the North Shoshone Allotment. Off-road vehicle use is limited in the area due to the broken terrain of exposed lava rock.

Only a few of the caves are easy to enter. In others, special rock climbing equipment is necessary for entry. All caves in the T-Maze Management Area require dependable light sources and spelunking skills for visitation and exploration.

NATURAL RESOURCE INFORMATION

A summary of the cave resources is presented for descriptive purposes. Detailed descriptions of each cave may be found in the Resource Summary.

The T-Maze Management Area includes approximately 9,750 acres of lava flow about nine miles north of Shoshone, Idaho (see Figure 1). Fourteen caves and one lava blister are known within this area. One cave, Mammoth Cave, is privately owned and will not be included in this management plan. Those resources included in this plan are Tee Cave, Maze Cave, Little Arches Cave, Gwinn Cave, Gwinn Cave Extension, Catskull Cave, Giant Arches Cave, Shoshone Pit Cave, Tomb North Cave, Tomb South Cave, Pigeon Hole Cave, Johnson Cave, Pot O'Gold Cave, and Abo Dome Lava Blister. The locations of cave entrances will not be published in this management plan.

Conditions of these caves vary from pristine to severely impacted from vandalism and trash dumping. Those caves that are least known have the least damage and have the greatest preservation of speleological features. Many of these features are fragile and extremely rare.

A variety of lava-flow caves can be found within the T-Maze Management Area. The longest of these caves is 1.37 mile. It is the longest of any mapped cave in the State of Idaho, with ceiling heights of up to 30 feet and widths in excess of 60 feet. Also, there are bottle-shaped, trap-type caves; a lava blister 23 feet across and over 10 feet in height; vents; and overflow tubes. Nearly every cave has some unusual or outstanding examples of speleological features. In addition to a variety of changing passage shapes and sizes, there are well developed lava tide marks, rare hornitos, extrusion

spires, lava stalactites and stalagmites, pressure ridges, encased lava tubes, lava roses, flow tongues, lava cascades, secondary mineral deposits, and seasonal streams and ponds.

Life forms found in the caves include bats, two species of wood rats, pigeons, ravens, gopher snakes, rattlesnakes, and yellow-bellied marmots. One species of spider, *Speleomaster lexii*, is a form of harvestman spider which is totally adapted to cave life in that it has lost all pigment and eyesight. This species, while not threatened or endangered, does have a limited and specialized habitat. This is a new species and may someday be classified based on its limited distribution. This is the only known location of this species.

Information about the bats is limited. A complete inventory and species listing has not been completed. At least one of the caves in the T-Maze Management Area is suspected of being a hibernaculum for bats (species unknown). In 1987, some bat studies should begin on this system.

Because there are no federal candidate threatened or endangered species found in the T-Maze system, no formal or informal Section 7 consultation (as required by the Endangered Species Act) is required with the U.S. Fish and Wildlife Service. If some of these species were found, we would proceed with informal and, if necessary, formal consultation.

No significant cultural resources have been noted in these caves and no significant paleontological specimens have been recovered, however, some specimens have been found.

POTENTIAL MANAGEMENT ACTIONS

This section presents a range of actions to achieve the management objectives. Individual actions, or combination of actions, may be selected for any cave or throughout the management area. Those actions selected appear in the implementation schedule (see page 10). Actions imple- mented could be accomplished through Bureau funding, cooperative management, volunteer agreements, or a combination of these.

Inventory, Documentation, and Monitoring

The first objective of protecting and preserving cave resources must be met by first establishing a record of the caves and their condition. Secondly, monitoring patrols establish a field presence which may deter vandalism and note deterioration. Finally, protection of the resources can be accomplished by limiting or eliminating agents of destruction. Actions 1 through 13 are designed to meet this first objective.

Action 1

Establish a photo inventory and monitoring program to provide a visual record of the current cave conditions. Project markers would be placed to

establish the photograph points designating the direction of the photo and the number. Care should be taken to record the more sensitive resources in the caves. The number of photo stations would vary from cave to cave, depending upon the desired coverage in each cave.

Photographs would be maintained in a file with year and date of the photo, and photograph point number recorded. Photos would be both slides and five-by-seven inch prints.

Frequency of photo monitoring tours should be based on the sensitivity of resources contained in the caves. Once every three years is the minimum frequency.

An annual report should be prepared discussing the results and effectiveness of the photo monitoring. It should assess the number of photo points in each cave and the need to remove or add observation points in each cave. Inventory and report forms as suggested by the American Cave Conservation Association should be used (see Appendix 1 to this plan, ACCA Cave Management Series, Volume 1, Number 1, December 1985).

Action 2

As part of the permanent management record of each cave, a map would be prepared of the cave interior. Each cave would be mapped at a minimum to a grade three standard as outlined by the Cave Research Foundation Map Standards, to show direction, features, and profile of the cave as well as photo monitor points. One map per cave is necessary. Existing maps must be brought to the grade three standard if they do not meet it.

Those caves with the most sensitive resources should be mapped first. Map standards may be graded as determined by the sensitivity of the resources in the cave and the need to document them. If additional rooms, chambers, or passages are discovered, they should be added to the map.

Action 3

A biological inventory of each cave would establish a biological profile of each cave to include vertebrate and invertebrate species. The profile would also include specific habitat management requirements, such as restrictions necessary to maintain an appropriate habitat, and these would become part of the cave management plan. In cases where federal candidate threatened, threatened or endangered species, or state species of special concern are identified, formal or informal Section 7 consultation pursuant to the Endangered Species Act will be conducted with the U.S. Fish and Wildlife Service. Management action identified as a result of this consultation will become part of the cave management plan.

Caves with any bats need at a minimum seasonal restrictions except to allow authorized research. There presently are no cave bats threatened or endangered in Idaho. The spotted bat is a federal candidate threatened, category 2, however it does not dwell in caves.

On species of invertebrate, *Speleomaster lexii*, has already been identified in three caves of the T-Maze Cave system. This species appears to have limited habitat. A specific habitat management plan would be written in the event that this species meets any of the federal candidate threatened, threatened or endangered species designations.

Action 4

Frequent monitoring and patrols during the season of use would establish a presence in the T-Maze Cave area, which would aid in detering vandalism to the caves.

Patrols would travel the roads and trails to the caves in the T-Maze Management Area to monitor use, examine the caves for vandalism, or to ensure that closures are maintained.

A report, with photos if required or taken, would be completed after each patrol indicating the condition of the cave and if additional management measures are necessary. This report would be forwarded to the responsible land manager for action or changes in management actions and would be maintained as a part of a permanent record of the cave.

Patrol and monitoring frequency should be scheduled according to the season of use and state of deterioration or improvement of the cave resource. Deterioration should indicate the need for increasing patrols and monitoring.

Vehicle Restrictions and Closures

To protect the cave resources, it may be necessary to limit or eliminate surface vehicle use in the T-Maze Management Area as well as limit maintenance and new road construction.

Where deterioration or vandalism of cave resources is occurring because of access to the resource by vehicles or surface traffic, closures or limitations would be exercised. Monitoring and patrols would provide this information. The area will remain open unless closed by a closure notice with specific limitations and exclusions.

Action 5

New road construction would be avoided in the cave management area unless a road is rerouted to avoid passing over a lava tube or cave, or it can be demonstrated that the new road would not damage the cave resources.

Action 6

No road maintenance would be allowed within 100 feet of where a lava tube or cave passes below the road.

Action 7

Vehicles operated within the T-Maze area should be confined to existing roads designated 3202, 3203, and 3210 on the District Transportation Plan.

Action 8

Two-track trails or foot paths leading to caves determined sensitive would be closed either by fencing and/or rehabilitating the area to obliterate traces of the access.

Action 9

When it can be determined that vehicle traffic on a road or roads in the T-Maze area is causing deterioration of a particular cave resource, this road, way, or two-track would be managed in such a manner as to prevent traffic from using the road.

Preclude Disturbance From Extraction

Although mineral potential is low throughout the T-Maze Cave area, discretionary measures such as planning amendments and stipulations should be used to prevent surface disturbance. Administrative closures and withdrawal could be used as the final preservation measure if needed.

Action 10

Saleable Minerals. Consider exclusion of the T-Maze Management Area from material sales or removal through next scheduled planning amendment opportunity.

Action 11

Require stipulations which would mitigate damage to the lava tube system for any minerals leased/sold within the T-Maze Management Area.

Action 12

Withdraw the T-Maze Management Area from mineral leasing and location, should Actions 10 and 11 be ineffective.

Close Access to Caves

Where vandalism, trash dumping, or other destructive activities cannot be controlled by any other means, the cave entrance should be closed. Ingress would be under supervision of district personnel. Such closures should not impede wildlife movement.

Action 13

In order to prevent vandalism to sensitive cave resources, the cave's entrance would be gated and locked, fenced, or obstructed by moving rock and debris over the entrance. The preferred method is to gate or fence cave entrances.

Blocking the entrance would only be acceptable where permanent closure is necessary to protect cave resources from vandalism and where other values such as wildlife would not be affected.

Permits

To meet Objective 2, providing for the proper utilization of the cave, a permitting system would be used along with signs and information brochures. Permits would be required where sensitive cave resources exist or where the cave may only be used during specified times of the year. The permitting system may also be used to reduce vandalism and graffiti in the caves and assure that clean-up follows activities at a cave. The addition of resource monitors may be necessary to protect the natural values or wildlife found in the cave. Cash bonds would be used to deter vandalism. Permits may not be necessary in all caves.

Action 14

Issue a permit for the use of the cave and require a cash deposit. Following an inspection by the authorized BLM manager and report of no effect, the cash deposit would be refunded.

Action 15

Issue a permit for use of the cave and require the presence of a resource monitor during use.

Action 16

Require a permit for each use of the cave with no deposit necessary.

Action 17

Allow use of the cave without permit or deposit, but maintain a register in the cave.

Signing

Since signs serve to attract attention as well as inform the public, such signs should be used sparingly around sensitive cave resources. Signs should

be a minimum size so as not to detract from the surrounding area. It may be necessary to place the signs just inside the cave entrance in some cases.

The need for signs may be determined by patrols and monitoring of the cave resources.

The kinds of signs installed in the area should include but not be limited to boundary signs, warning signs, information signs, and special area designation signs. The signs should inform the public of the land status, indicate that certain activities are illegal on public lands direct interested persons to the caves, and inform the public of potential hazards. The kinds of signs are as follows:

1. Boundary signs should be placed in the area to identify public lands.

2. Regulatory signs should be placed near the cave entrances to inform the public that it is illegal to paint graffiti, damage the caves or dump trash, and inform them of special requirements such as the need for a permit to use the cave.

3. Warning signs, where appropriate, should be placed by caves that contain hazardous conditions or require special equipment to enter.

4. Information signs would inform the public of the natural historic value of the cave or special features to be found in the cave. Such signs should also be placed at the entrance of the area and may explain where additional information may be found and about permit requirements.

Action 18

Place boundary signs in the T-Maze Management Area or at the cave entrance.

Action 19

Place regulatory sign(s) at or near the entrance of the cave or within the management area.

Action 20

Place warning signs near the entrance of a cave or within the cave management area.

Action 21

Place information signs at the entrance of a cave or within the cave management area.

Information Brochures

The BLM would develop and provide the public with information brochures about the sensitive nature of the caves, the animals that live in them, and the requirements regarding the use of caves.

As new information and regulations are put in effect, these brochures would be updated.

Action 22

Prepare brochures for public inquiry.

Restoration and Stabilization

The final objective of restoring the cave to its natural condition would be met by cleaning up trash and graffiti and stabilizing if necessary.

Since the majority of the damage to the caves has been from vandalism, it is important to remove graffiti and trash to restore the natural character of the cave. Some materials dumped in or near the caves may be considered a health or safety hazard. Natural deterioration such as roof fall, exfoliation, or erosion would not be treated as needing restoration unless such deterioration constitutes a hazard to users or can be mitigated without adversely affecting the natural character of the cave. Monitoring and patrols would be used to determine the need of restoration measures.

Action 23

Remove graffiti from cave exterior and interior.

Action 24

Remove trash from cave area. Priority should be given to the caves where the trash constitutes a health or safety hazard.

Action 25

Stabilize or remove hazards from natural deterioration.

MANAGEMENT EVALUATIONS AND REVISIONS

Each year the actions implemented under this management plan shall be evaluated with respect to the effectiveness in accomplishing the management goals and objectives. It would be the purpose to examine the condition of the caves to determine if the values are being protected and preserved. At this time, the implementation of actions may be revised to respond to new conditions or new agents which are affecting the values in the caves. Also, at this time, it may be necessary to propose new actions to respond to previously unknown conditions in the caves or in the cave management area.

Such revisions may also reflect non-cave or management area conditions such as increased or decreased funding for cave management or expansion of the cave management area.

The report prepared for this evaluation shall become a part of the cave management plan. This report would also contain an implementation schedule, if revised, for subsequent years and would be used to bridge the gap between this plan and the district annual work plan.

IMPLEMENTATION SCHEDULE

Table 1 in this section shows the proposed implementation schedule of the actions described in this management plan. The proposed schedule is based upon current funding levels, existing cooperation from volunteers, and the highest priority needs of the caves. The proposed schedule depicted here is subject to annual review and revision and may change based upon the outcome of studies and monitoring. The recreation program would fund aspects dealing with issuing permits, holding bonds, and compliance with those permits.

TABLE 1

IMPLEMENTATION SCHEDULE

OBJECTIVES	Protect and Preserve Cave Resources														Provide for Proper Utilization										Stabilization and Restoration		
ACTION CATEGORY	Inventory			Protection											Permits				Signs								
ACTION STEPS	Photo Document	Mapping	Biological Inventory	Monitor and Patrol	Avoid New Roads	Limit Road Maintenance	Exclude Heavy Equipment	Close Two-Track and Foot Paths	Close Specific Roads	Exclude From Saleable Minerals	No Surface Occupancy	Withdraw From Leasing	Close Caves by Gate or Obstruction		Issue Permit With Cash Deposit and Resource Monitor	Issue Permit With Resource Monitor	Issue Permit	Free Use With No Permit or Deposit	Boundary Signs	Regulatory Signs	Warning Signs	Information Signs	Information Brochures		Remove Graffiti	Remove Trash	Hazard Abatement and Stabilization	
ACTION STEP NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13		14	15	16	17	18	19	20	21	22		23	24	25	
Entire Management Area				All Years	Begin FY 87	Begin FY 87	Begin FY 87			FY87	FY87								FY87				FY87					
Tee Cave	FY 87	FY 87																FY87							FY88	FY87		
Maze Cave	FY 87	FY 87															FY87								FY89	FY87		
Little Arches	FY 87	FY 88																FY87										
Gwinn Cave	FY 88	FY 88	FY 87										FY87														FY88	
Gwinn Extension	FY 88	FY 89																FY87										
Catskull	FY 88	FY 89																FY87										
Giant Arches	FY 88	FY 90	FY 87														FY87											
Shoshone Pit #1	FY 89	FY 90															FY87											
Tomb North	FY 89	FY 91															FY87											
Tomb South	FY 89	FY 91															FY87											
Pigeon Hole	FY 90	FY 92																FY87										
Johnson	FY 90	FY 92																FY87										
Pot O'Gold	Done	Done	FY 87					FY88					Done			FY87				FY87								
Abo Dome	FY 90	FY 92																FY87										

RESOURCE SUMMARY

This summary includes most of the detail of the caves in the T-Maze Management Area. There are several areas that remain to be studied. For example, the biological populations in the caves are not well known. Bat populations are known but the exact species or seasons of use are still in question. Further study in this area would enhance our understanding of cave ecology and the benefit of protecting such populations.

Life forms found within the caves range from common to the unusual. Among the common species are wood rats, ravens, feral pigeons, gopher snakes, rattlesnakes, and yellow-bellied marmots. Bats, a species commonly associated with caves, can also be found within the caves. Although specific identification has not been completed, as many as three species are common to the area. A number of invertebrate species are common in the cave environment. One unusual species, *Speleomaster lexii*, is a small harvestman spider specially adapted to the cave environment has been found within the T-Maze area.

The caves in the T-Maze Management Area are formed from a basaltic lava flow originating at Black Butte. The age of the flow is uncertain, but the best guess is several thousand years. The flow extends from its low volcano shield source to a point approximately seven miles to the south. Both pahoehoe and aa forms can be recognized in this flow. The formation of lava tubes in a lava flow is a function of topography, gradient, and the viscosity of the lava. Usually only lava of a lower viscosity forms lava tubes. The size of lava tube formed by the pahoehoe lava can vary greatly from a few inches to many feet in diameter depending upon the thickness of the flow, the rate of cooling, slope, and several other factors.

Once the lava flow ceases within the tube, cooling begins and part of the tube, or in some cases all of the tube, collapses. It is during this period that many of the distinctive features of the lava tubes are formed. The retreating lava leaves the tube with molten material remaining behind. From this material are formed the lava stalactites and stalagmites, lava roses, extension spires, and hornitos. Many of the caves in the T-Maze system have excellent examples of these features.

Tee Cave

Tee Cave is well known by local recreational users and the organized caving community. One of the larger segments of the system with 3,700 feet of mapped passage, Tee Cave is a secondary lava tube with two intersecting passages. Most of the passage is extremely wide with very little collapse or breakdown. The most outstanding features of this cave are well developed tide benches located at the intersection of the entrance passage and the main conduit, and a well-defined lava tongue at the eastern terminus of the main passage. A lava tongue blocks the inter-connection to the primary lava conduit, Maze Cave.

Although vandals have removed most of the smaller and more fragile lavacicles and speleothems, the cave remains in a relatively good state. Recreational usage has brought an increase of litter and graffiti.

Maze Cave

Maze Cave is an 1,800-foot, multi-level segment which once was the primary lava conduit in this area and was connected to Tee Cave. An overflow plug only a few feet thick now separates the two caves. There are two levels of Maze Cave separated by a 20-foot long shaft. The primary passage is connected to several smaller passages and crawlways. A number of interesting flow surge features are present including a uniquely ruptured roof separating the two levels. Also present are lavacicles and secondary mineral deposition which has created a number of small, fragile coraloid speleothems.

Damage in the cave includes spray painting and the removal of lavacicles and speleothems. Litter is also a problem. Because Maze Cave is complex, it is also a favored location for speleologists and spelunkers.

Contains bats, possibly *Speleomaster lexii* too.

Little Arches Cave

Little Arches Cave is a short segment of a primary tube containing two levels. It is not well known yet provides moderate challenges to explorers. Beginning in a relatively low, breakdown-filled crawlway, the upper level soon leads to a large passage and ends at an 11-foot drop which can be negotiated without special equipment other than a hand line. The lower level is a larger clay-filled passage constricted by a crawlway which forms a sump when meltwater ponds up during the spring. This level may also be reached by a breakdown-filled crawlway beginning just inside the entrance.

Neither of the passages in Little Arches Cave contain outstanding or exceptional features. Because it is relatively unknown, vandalism has been minimal.

Gwinn Cave

Gwinn Cave has received the most damage since it is easily accessible by road. This cave has been a favorite trash dump for several years. Substances containing arsenic have been dumped here in the past. The cave is a large diameter passage containing well developed tide marks and silt-filled sink holes formed when the floor of the upper level collapsed.

Speleomaster lexii has been found in Gwinn Cave.

Gwinn Cave Extension

Gwinn Cave Extension is a short, breakdown-filled cave with mostly crawlways and one larger room. The most significant feature of this cave is the occurrence of the *Speleomaster lexii*, a rare harvestman spider, which is adapted entirely to cave life having lost all pigment as well as eyesight.

Although Gwinn Extension has been disturbed, damage is not extensive. The cave's wildlife values are classed as sensitive species.

Catskull Cave

Catskull cave is a long, sinuous segment of primary passage near the southern end of the flow system. Its upper end contains an excellent example of an aa flow tongue which emerges from an inverted syphon. Many of the passages contain excellent examples of a number of lava tube flow features such as rails, cornices, ledges, and pahoehoe molds from the ceiling.

Catskull Cave has had little disturbance in the rear portion of the cave. Some minor vandalism can be noted in the front of the cave.

Giant Arches Cave

Giant Arches Cave, also known as Bat Cave, is a short, breakdown-filled primary passage of large diameter. This cave does have an abundance of vertebrate and invertebrate animal life. Large colonies of bats with long ears can be found there during the winter months.

Shoshone Pit #1

At the source of the lava flow which formed the T-Maze area is Shoshone Pit #1. Atop a vent is a 24-inch diameter hole which opens to a 30-foot vertical drop through a bottle-shaped pit. At the bottom, there is a short segment of cave with excellent examples of drip stalagmites and splash concentrics, formed when dripping lava splashed onto the surface of the cooling flow and congealed.

Because Shoshone Pit #1 requires a great deal of technical skill to enter, the cave remains in pristine condition.

Tomb North Cave

Tomb North Cave, near Gwinn Cave, is a segment of surface overflow tube which branches away from the primary tube and parallels the main flow system. This has formed a moderate size passage containing several crawlways.

This cave remains in a relatively undisturbed condition.

Tomb South Cave

Tomb South Cave is a continuation of the same overflow system as Tomb North Cave. This cave provides some interesting contrasts with its rectangular lower section, deflation features, small lava stalagmites and secondary mineral deposits, all in a relatively undisturbed state.

Pigeon Hole Cave

Pigeon Hole Cave is a short section of lava tube with access through a 20-foot deep vertical descent. As a well-used pigeon roost, the floor is

covered with a deep layer of guano. While the entrance room is quite large, the majority of the cave has low passages which include some very tight crawlways. The cave contains many small lava stalactites and secondary mineral deposits.

Johnson Cave

Johnson Cave is actually three segments of passage accessed from one large sinkhole entrance. Although all three passages are relatively short, there are a number of outstanding flow features in the cave including multiple levels, rails, and an encased tube.

Pot O'Gold

Pot O'Gold Cave is the most recently discovered segment of the cave system and the most outstanding of the caves within the management area. At 1.37 miles in length, it is the longest of any mapped cave within the State of Idaho. Pot O'Gold is a primary tube with ceiling heights of up to 30 feet and widths in excess of 60 feet. Collapses and breakdowns within the cave range up to 30 feet in height and 330 feet across.

A variety of features can be found inside this cave. Some areas have thousands of lava stalactites and stalagmites, many exceeding three feet in length. Extrusion features such as hornitos, spires, and concentric rings which are rare and seldom found even on the surface of new lava flows are abundant in Pot O'Gold. Fragile lava roses formed by cooling gas bubbles on the surface of the flow are perfectly preserved and cover large portions of the passage floor.

Secondary mineralization in the cave has left large areas of sparkling white crystalline mirabilite and thernadite deposits as well as calcite and gypsum deposits which have formed cave coral. One of the less obvious forms of secondary mineralization is a pure iron compound that forms blue deposits on the cave walls.

Base have been found in this cave.

Abo Dome

Abo Dome is a large lava blister which is a single room nearly 20 feet in diameter and over 10 feet high. This makes Abo Dome among the largest lava blisters found in Idaho. Current condition is unknown.

ACCA CAVE MANAGEMENT SERIES

Volume 1, Number 1
December 1985

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ACCA CAVE MANAGEMENT SERIES

Foreword

As a resource, caves are valuable for a variety of reasons. These values range from recreational to scientific in nature and present difficult management challenges for both owners and managers. The ACCA Cave Management Series is published by the American Cave Conservation Association, Inc. as an aid to those who are faced with the unique problems associated with the management of caves. A collection of works on various aspects of cave management prepared by recognized authorities in each field, the series is intended to provide guidance in the logical identification and evaluation of significant cave resources; the resolution of potential conflicts and in the employment of the various methods available in the development and implementation of management actions which will be most effective and which will meet standards set by state and federal law.

Cave management is not a simple task. It involves learning to identify long term goals; to recognize numerous real and potential problems; selection of the best actions to deal with those problems and then integrating these actions into a well-coordinated program. Generally speaking, it is important that those seeking to manage caves realize that the perfect plan does not exist. Local situations and circumstances will often necessitate creative variations, to tailor a program to a specific cave or region.

The ACCA Cave Management Series is directed at both private owners and those who administer caves on lands owned by various state and federal government agencies. Because of this, information will sometimes be general in nature. Local laws and regulations and even different policies within the various agencies of the state and federal government may dictate specific actions. Whenever feasible, we will cite these differences. It is generally recommended, however, that cave managers refer to the laws, regulations and policy manuals which apply to their own specfic situation. Consulting with local legal counsel is always advisable when developing a management program for a privately owned cave.

Cave management can be both costly and time consuming. These costs may be reduced or eliminated by the use of volunteers. There are thousands of cave users throughout the United States, most of them associated with the National Speleological Society and its chapters which are usually referred to as grottos. This group is heavily oriented to cave exploration as an avocation. Many care a great deal about the proper protection of cave resources and are willing to assist with cave management problems on a volunteer basis. The federal government, especially in the west, has many cave management programs which are operated entirely by volunteers under formal volunteer and cooperative management agreements.

While most recreational users may have a strong affection for the spelean environment, experience and background in cave management is often limited and there are potentially serious problems associated with the use of volunteers. Cave owners and managers should be aware of each element involved in proper cave management, including both pertinent law and potential problems. This will allow them to monitor volunteer activities to ensure the development, implementation and administration of a sound program.

On the other hand, the effective cave manager may find it necessary to employ professionals when, for example, time is a critical factor or qualified volunteer personnel simply isn't available.

Volume One of the ACCA Cave Management Series is devoted to presenting an understanding of the value of caves; of ways in which significant caves and resources values can be identified and

evaluated; and of the initial steps needed to insure that the cave is protected from damage. Subsequent volumes will deal with a variety of specific problems and solutions, including the use of information and education to enhance management; volunteer management programs; gate designs; hydrology; liability; access restrictions; and state and federal laws.

Very little information on restoration will be found in the early volumes of the series. This is primarily due to the need to concentrate on bringing the continuing increase in degradation of cave resources to a halt. Restoration is an extremely costly and time consuming process. During the time it takes to remove one square foot of grafitti, vandalism and poor management will have contributed to destruction or damage in dozens of other improperly managed caves. For this reason, the ACCA Cave Management Series will concentrate initially on prevention rather than restoration.

You will also note that the ACCA Cave Management Series is devoted primarily to the management of undeveloped "wild" caves, rather than commercial or tour caves. Information on the management of these types of caves is already available and may be obtained by contacting the National Caves Association. There are, however, several areas in which the series may be of use to commercial operators. As new information and techniques for low-impact commercial development becomes available it will be made available through the series.

Again, keep in mind that there is no single "best" answer and that while these are tried and proven methods, varying local conditions may require adjustments to meet specific needs. It is also important to remember that cave management is still in its infancy and will continue to change as new information and experiments lead to improved techniques. For that reason, the ACCA Cave Management Series is intended to be a guide, presenting the best of current technique and methods, and will never be finished. We hope that you will find this series of publications a useful tool in learning to protect America's most unique and fragile resource through proper management.

Jer and Helen Thornton, Editors

SPELEAN RESOURCES INVENTORY AND EVALUATION GUIDE

By Jim Nieland and Jer Thornton

Introduction

Accurate and adequate information is the basis upon which all sound business decisions are made. The more complete and accurate that information, the better we are able to evaluate a situation and then to take appropriate action to best ensure a desired result. The same is true for cave management, which if dealt with properly is a business. Whether planning to acquire a cave, or to develop and implement a management program, selecting an effective course of action will depend heavily upon how much is known about the cave.

There are presently several inventory and management guides available to cave managers. These were developed primarily to assist government land managers in compiling information about caves. One of the most popular and most comprehensive is the New Mexico System. Originally developed by Jerry Trout, cave specialist for the Guadalupe District, Lincoln National Forest in New Mexico, it has been used with a variety of minor alterations by several National Forests, National Parks, the Bureau of Land Management (BLM) and several state agencies. The most recent version, titled the "Cave Classification and Inventory System, was developed by Joe B. Hummel, cave management specialist for the Roswell (New Mexico) District of the BLM. Greatly expanded and improved upon, this version includes the use of codes for computor application.

One of the primary features of the New Mexico System is a dual classification code which uses the inventory information to automatically assign a number of management actions, primarily revolving around physical and legal closure of the cave. The first classification rates the cave based on its features and contents and the other, according to hazards.

It was felt that there were still a number of serious problems with the New Mexico System. First, it contains specific management directives which did not allow for variation or adjustment. Those directives call for one solution to all special cases---closure of the cave. Secondly, the NM system does not integrate all factors in the evaluation of the significance of the cave. Instead, it bases classification upon specific single features, ignoring the overall relationship and local, regional or national significance. It was also incorrectly organized, with various types of data listed in improper categories, often asking for insufficient data upon which to base management decisions. Finally, it does not call for substantiation of data.

We originally set out to simplify and smooth out the system, by allowing more flexibility in the prescriptive aspects contained within each of the classifications. It became evident that this could not be done without approaching the problem from a less-absolute direction.

Rather than "classify" caves and hazards, we have created a system which simply helps establish the significance of a cave based on the quality, quanitity, sensitivity and threat to various components of the cave's contents and features. Because those features which present difficult obstacles or risk are considered a factor important to the enjoyment of many recreational users, we have chosen to assign a level of difficulty rather than a "hazards" rating.

The use of codes was, in most instances, intentionally avoided. This was done to make it possible for persons who wish to use the guide to do so without continually referring to menus for an explanation. Data has been rearranged in proper categories with each category more

distinctly separated. Where necessary, additional information is requested. This Guide does simplify but it does not streamline. Its purpose is to provide a comprehensive and easy to use method by which the full significance of a cave can be assessed, and by which potential management problems can be identified.

As mentioned earlier, management decisions are dependent upon proper interpretation of data and subject to local variations in circumstances. Therefore, the "Spelean Resource Inventory and Evaluation System" intentionally avoids management directives since these mandates cannot possibly take all of the possible variations in local situations into account. In those cases where state and federal law require specific prohibitions or actions, the priority rating has been more heavily rated.

The "Spelean Resources Inventory and Evaluation System" will not lead to automatic management decisions. It will provide an orderly guide to gathering and assessing information necessary to making those decisions. As such, it will be helpful to anyone considering active management of cave resources irregardless of whether the cave is privately owned or part of the public domain.

I. General Instructions

The "Spelean Inventory and Evaluation System" is comprised of three basic components: The Master Profile Form; the Inventory Checklist and Data Guides; and the Significance Rating and Difficulty Level Guides.

Completion of the master profile begins when you become aware of a cave and continues over an indefinite period as more data is gathered. Assigning "significance ratings" is dependent upon gathering sufficient inventory data, and may require adjustment of ratings as more information comes available. Proper documentation of information sources and references is essential, especially when caves are located on the public domain.

The normal procedure for using this system is:

1. Enter all information which is known on the master profile form.
2. Inventory the cave.
3. Evaluate the inventory data to determine significance rating and difficulty levels.
4. Develop and implement management plans.

In actuality, it may be necessary to enter the process at any point and the process may require several cycles. For example, an inventory may indicate the cave environment has a high potential for a significant biotic community. This points to the need for additional biological inventory and study. Once the new inventory and study is completed, reevaluate the significance rating. Each portion of the inventory and evaluation system is generally self-explanatory. However, familiarization with the instructions and data defininitions in each section, prior to beginning, will be quite helpful.

Finally, you may discover that a system is so complex, so large or filled with so many significant features that an inventory may be needed for each section. In this case it may be necessary to treat each segment separately or to simply use the Guide as a checklist during the preparation of a map, noting various features directly into survey notes.

II. Master Profile Form Instructions

This form is intended to be used to provide a summary and an overview of data known about a cave. As such, it will also serve as a checklist for the manager in determining the need for additional field inventories or studies.

A. Name of Cave. If the cave has already been named, use that name. If the cave is known by several names, the following criteria should be considered in assigning a name:

1. use the historic name or the name given by the original discoverer;
2. when the historic name cannot be determined, use the name published in technical reports, professional papers, research studies or cave maps.

If the cave is unnamed, assign one, preferably a name that is descriptive of the cave. Care should be taken to avoid using names that refer to its location. Do not, for example, use names which refer to nearby geological or geographic sites. It is also important that the name has not already been given to another cave with in a managing unit, district or general vicinity.

B. Agency/Ownership. If located on the public domain, give the name of the administering agency. This should also include the name of the specific unit, area, or district upon which the cave is located. If an entrance or any portion of the cave lies or is believed to lie upon or under privately held lands, enter the name and address of the owner(s). In some cases it may be necessary to continue on the back of the form.

C. Location and Cave Number. List the following information:

1. Give the legal location of the cave. Include state, county, township, range, section and $\frac{1}{4}$ of $\frac{1}{4}$ of $\frac{1}{4}$, USGS map quad and series. If metes and bounds system is used give the location in longitude and latitude coordinates to the second.
2. Narrative Description. Prepare a road log and detailed narrative description of the entrance location, using permanent landmark references. Give compass bearings from entrance to at least two major permanent visible landmarks.
3. Actual or estimated elevation of known entrances above sea-level.
4. Photo Number. Give the number and series of aerial photos on which the cave location has been marked.

5. Assign a coded numerical designation for the cave as follows:

(a) In locations with rectangular surveys, using the following method. If a cave is found in Section 9, township 3 North, Range 2 East, and is the first cave known in section, it would be coded: 3N-2E-9-1 The first three digits refer to the map location and the fourth to the specific cave. The next cave found within that section, will be given code number 3N-2E-9-2.

(b) When the location is taken from a metes and bounds map, use the latitude and longitude. For example if a cave is located at 116 degrees, 22 minutes, 18 seconds East and 36 degrees, 10 minutes, 5 seconds North, and is the third cave found at those coordinates, it would be given the following code: 116/22/18E-36/10/5N-3.

D. Historical Information. Past and present information concerning the cave should be described here. (Reference or append pertinent documentation reports or other supporting materials.) This information, when known, will include:

1. The date of discovery and the name of the person who discovered it.
2. The name of the person or groups who first explored and/or mapped the cave.
3. Maps of the cave. Describe the reliability of the map, using the Cave Research Foundation grading system.
4. Known uses of the cave.
5. Primary users of the cave when identifiable.
6. Studies or research conducted or being conducted within or relevant to the cave.
7. Past and present cave management activities.
8. Past and present surface management or use activities which have or may affect or impact the cave.

E. Geological and Geophysical Information. Using the Inventory Checklist, give a brief summary of the following information:

1. type of cave based on geological development.
2. dominant rock in which cave is formed.
3. describe geological formation(s) in which cave is located.

(Reference or append supporting papers, reports, geological maps, etc., where appropriate. Attach the Inventory Checklist.)

F. Geographical Information. Give a summary of the following information when known:

1. hydrological setting including recharge area and discharge areas for water found in or moving through the cave.
2. vegation above the cave and within the hydrological setting.

(Reference or append supporting papers, reports, geological maps, etc., where appropriate. Attach the Inventory Checklist.)

G. Contents Summary and Rating. List those items of significance from the inventory checklist. Use the "Significance Rating Guide to determine the proper rating. Enter that code.
(Reference or append supporting papers, reports, geological maps, etc. Attach the Inventory Checklist)

H. Difficulty Levels. List those items from the Difficulty Factors Checklist which present potentially difficult obstacles to users and/or will require special equipment or skills to safely overcome. Use the Difficulty Level Guide to determine the appropriate rating. Enter the code. (Attach the Inventory Checklist.)

II-A. Master Profile Form

A. Name of Cave: _____ / B. Name of Owner: _____
/ Address: _____
C. Cave number: _____ / _____

D. Location: Significance (from H) _____
1. Legal- _____ Difficulty (from I) _____
2. Narrative Description- _____

E. Summary of Historical Information: _____

F. Geological and Geophysical Information:
1. Type of Cave- _____ 2. Dominant Rock- _____
3. Geological Formation(s) in which cave is formed- _____

G. Geographical Information:
1. Hydrological Setting- _____

2. Ground Cover/Vegetation/Biomass (above cave): _____

(within hydrological setting): _____

(in and around entrance): _____

MASTER PROFILE FORM - Page Two

H. Contents Inventory Summary

Management Priority Rating Code

1. Cultural
   a. historical _____ .
   b. archaeological _____ . - __
2. biological _____ . - __
3. paleontological _____ . - __
4. geological/mineralogical _____ . - __
5. structural _____ . - __
6. environmental _____ . - __

Describe in detail, all contents/features for which a Management Priority Rating of "2" or higher is given: _____

_____

_____

_____

_____

_____

_____

I. Difficulty Factors

List all difficulty factors rated High or Moderate. Difficulty Level

_____ . _____

_____ . _____

_____ . _____

_____ . _____

_____ . _____

_____ . _____

_____ . _____

_____ . _____

Describe in detail, all factors which have been assigned a Difficulty Level rating of High or Moderate; the location of hazards in the cave; and specialized skills, training, clothing or equipment which might be needed by users: _____

_____

_____

_____

_____

_____

Are these located in an isolated portion of the cave? _____ . If yes, can the remainder of the cave been given a lower Difficulty Level rating (Explain in Detail): _____

_____

_____

_____

III. Inventory Checklist Instructions

Section VI has been broken down into seven separate checklists according to various categories in relation to each type of information sought. Each checklist can be copied for use in the field. Enter the information requested. It is extremely important that properly qualified personnel conduct the inventory and for several segments, professional scientists may required to obtain or evaluate information. For example, assessment of the biological potential of the cave based on environmental factors will require the expertise of a qualified biologists or ecologists.

One of the most important field tools for the purpose of conducting an inventory is a reliable map of the cave. If a survey of the cave is not available, preparing one should be given serious consideration.

The General Inventory Checklist is intended as an initial field inventory form from which basic information can be used to begin a Master Profile Form. For more specific inventory data, ie, biological, or cultural resources, use the appropriate Checklist. Codes listed in the General Inventory Checklist are for the development of a computor data base and may be ignored.

Status and/or adaptation level codes, like those found on the checklists for both cultural and biological resources are not optional and must be entered. Information pertaining to status, adaptation, significance, etc., is generally found in the general instructions contained on each checklist. In those cases where there are several possible codes or additional explanations are necessary those follow on the page immediately following the checklist.

III-A. General Inventory Checklist

_____ _____
cave name cave number

_____
person/group performing inventory _____
(date of work)

_____
person preparing checklist if different

A. General Information

1. Location -

a. legal: _____

b. narrative. Describe how to reach and locate cave. Include all information which will help relocate the entrance(s). Give compass bearings from entrance to at least two (2) permanent geographic features, noting whether readings were true or magnetic. _____

_____

_____

_____

_____

_____

_____

_____

c. elevation: _____ estimated or actual? _____

B. Geophysical/Geological Information. Codes are for computer application only.

(Circle the appropriate items.)

1. Type of cave based on geological development.	Code
a. Solution	S
b. Volcanic	V
specific type	--
- vent	ve
- lava tube	lt
c. Fissure	F
specific type	--
- tectonic	tt
- gravity block	gb
d. Littoral	
e. Pseudokarst (erosional)	PS
f. Glacier or Firn	GF
g. Talus	TS
h. Other	OO

2. Dominant rock in which cave is formed.	---
a. dolomite	DO
b. gypsum	GY
c. halite	HA
d. marble	MA
e. limestone	LS
f. travertine	TR
g. basalt	BA
h. rhyolite	RY

i. granite	GR
j. gneiss	GN
k. conglomerate	CG
l. shale	SL
m. slate	ST
n. shist	SH
o. sandstone	SS
p. ice, firn, snow	IF
q. silt	OO

3. Geological Formations in which cave is located. Begin with the oldest and work forward in time. Specify in which unit the entrance is located. _____

_____

_____

_____

C. Misc. Geographical Information

1. hydrological setting: Summarize the general area hydrology. Include known information on recharge areas, resurgences, drainage area, annual rainfall, depth to water table, and regional groundwater movement. _____

_____

_____

_____

_____

_____

2. vegatation and ground cover: Describe the dominant types and species of plants, trees and other flora within the entrance or sink hole; above the known cave passage; and within the general hydrological setting. _____

_____

_____

_____

_____

_____

III-B. Cultural Resources Inventory Checklist

_____ _____
name of cave cave number

_____
person/group performing inventory _____
inventory date

_____
person preparing checklist if different

Signif. Rating

1. historical remains, evidence or other significant elements present. Enter "1" under significance rating. ____
   a. describe: _____
   _____
   _____
   b. If the site is sensitive and vulnerable to damage, enter "Y" at right. If not, enter an "N". ____
2. archaeological remains, deposits or other evidence present. Enter "1" at right under code. ____
   a. describe: _____
   _____
   _____
   b. If the site is sensitive and vulnerable to damage, enter "Y" at right. If not, enter an "N". ____
   c. Potential. Many caves entrances can be expected to contain cultural resources, even though physical evidence is not easily identifiable. If the entrance is large, faces south, is relatively close to a source of water or just looks relatively comfortable it is reasonable to assume that professional investigation is justified. Things like smoke darkened ceiling or walls in the entrance are also good clues. If you feel that the cave may be a potential cultural site enter "2" under code. __
   Describe the entrance area and any specific features which led to this rating. _____
   _____
   _____
   _____
   _____

III-C. Biological Resources Inventory Checklist

_____ _____
name of cave cave number

_____
person/group performing inventory

_____ _____
inventory date

_____
person preparing checklist if different

1. Environmental factors for assessment of habitat conditions and biotic potential.
   a. Relative Humidity: ___ - ___ %. Date: _____.
   ___ - ___ %. Date: _____.
   ___ - ___ %. Date: _____.
   ___ - ___ %. Date: _____.

   b. Temperatures:
   (1) air: (a) ___ degrees F or C. Date: _____.
   Location: _____.
   (b) ___ degrees F or C. Date: _____.
   Location: _____.
   (c) ___ degrees F or C. Date: _____.
   Location: _____.
   (d) ___ degrees F or C. Date: _____.
   Location: _____.
   (e) ___ degrees F or C. Date: _____.
   Location: _____.
   (f) ___ degrees F or C. Date: _____.
   Location: _____.
   (g) ___ degrees F or C. Date: _____.
   Location: _____.
   (h) ___ degrees F or C. Date: _____.
   Location: _____.

   (2) water: (a) ___ degrees F or C. Date: _____.
   Location: _____.
   (b) ___ degrees F or C. Date: _____.
   Location: _____.
   (c) ___ degrees F or C. Date: _____.
   Location: _____.
   (d) ___ degrees F or C. Date: _____.
   Location: _____.
   (e) ___ degrees F or C. Date: _____.
   Location: _____.
   (f) ___ degrees F or C. Date: _____.
   Location: _____.
   (g) ___ degrees F or C. Date: _____.
   Location: _____.
   (h) ___ degrees F or C. Date: _____.
   Location: _____.

c. Aquatic Substrate:
(1) Pools/Lakes
(a) Occassional
Location: _____.
Source if known (flooding, surface water percolation, etc.): _____.
Dates observed: _____, _____, _____, _____.
(b) Seasonal
Location: _____.
Source if known: _____.
Approximate dates pools exist: _____ to _____.
(c) Permanent
Location: _____.
Source if known: _____.
(2) Streams
(a) Occassional
Source: _____.
(b) Seasonal
Source: _____.
(d) Permanent
Source: _____.
Specify how sources were determined (speculation, observation, dye tracing/hydrological studies/reports, etc.).

d. Deposits and fills. Be specific. Describe size and extent of deposits. Give moisture contents in percentage when measured. If estimated list as high, moderate or low.

	Moisture Content
(1) Organic	
(a) bat guano	_____
(b) other fecal material (specify)	_____
(c) nest materials	_____
(d) animal remains	_____
(e) plant remains	_____
(f) other organic materials	_____
(2) Non-organic (specify size/type)	
(a) clay	_____
(b) sand	_____
(c) gravel	_____
(d) rocks/boulders	_____

e. Energy Input (Organic materials) Check those that apply.
(1) biotic
(a) carried in by animals
(b) animal remains/carcasses
(c) fecal droppings
(d) tree/plant roots
(e) bat guano
(2) Abiotic
(a) waterborne
-discrete runoff inwash
-seasonal or floodwaters
-permanent stream
(b) airborne

2. Species Present in Cave

_____ _____
name of cave cave number

_____
person/group performing invenotory

_____
inventory date

_____
person completing this form if different

List all species collected or observed during the inventory or reported to inhabit the cave. (Reference or append supporting documentation.) When known, list both common and scientific names (including subspecies), and adaptation. Indicate any species designated for special consideration by state or Federal laws. For a partial list of species which may be found and codes for computer application, see appendix A.

a. Species (bats are to be listed separately under B.)	Adaptation Level (from b.)	St. or Fed. Status (from c.)
(1) _____	____	____
(2) _____	____	____
(3) _____	____	____
(4) _____	____	____
(5) _____	____	____
(6) _____	____	____
(7) _____	____	____
(8) _____	____	____
(9) _____	____	____
(10) _____	____	____
(11) _____	____	____
(12) _____	____	____
(13) _____	____	____
(14) _____	____	____
(15) _____	____	____
(16) _____	____	____
(17) _____	____	____
(18) _____	____	____
(19) _____	____	____
(20) _____	____	____
(21) _____	____	____
(22) _____	____	____
(23) _____	____	____
(24) _____	____	____
(25) _____	____	____

b. Adaptation Level

Code Description/Definition

OC - "Occassionals". Common mammals, birds, reptiles, invertebrates, etc., which are often found in caves, particularly near entrance areas. While these animals may use portions of caves for nests, dens, roosts, a source of water, they are not dependent upon the cave for habitat nor are they able to complete their entire life cycle within it.

AC - "Accidentals". Common animals which enter or are swept into a cave and trapped there by accident. These animals cannot complete their life cycles within a cave environment.

TX - "Trogloxenes". Animals which may need (or prefer) caves or cave-like environments for major portions of their life cycle but must return regularly to the surface for certain needs, i.e., food. (Bats, packrats and cave crickets are common troglоxenic species.

TP - "Troglophiles". Animals which can live and complete full life cycles in certain caves or in suitable surface environments. Troglophilic species generally exhibit no special adaptations.

TB - "Troglobites". Animals which must complete their entire life cycle within a cave. Troglobitic species generally exhibit one or more special adaptations, including loss of sight, increased development of other sensory organs, loss of pigmentation, slower reproduction and smaller size than related terrestrial species.

UN - Unknown Adaptation

c. State or Federal Species Status

	Code	Description
(1)	FP	- proposed for Federal listing as "Threatened".
(2)	FA	- proposed for Federal listing as "Endangered".
(3)	FC	- candidate for Federal listing as "Threatened".
(4)	FB	- candidate for Federal listing as "Endangered".
(5)	FE	- Federally listed as "Endangered".
(6)	FT	- Federally listed as "Threatened".
(7)	SS	- listed as "sensitive" by state.
(8)	ST	- listed as "threatened" by state.
(9)	SE	- listed as "endangered" by state.
(10)	OO	- other

3. BATS. Inventory Guide and Checklist

_____ _____
name of cave cave number

_____
person/group performing invenotory _____
inventory date

_____
person completing this form if different

List all species (and subspecies) observed or collected in cave during during inventory and reported in past Due to variations in protective status for certain subspecies, it is important that subspecies be listed. Indicate: population figure during the inventory and/or reported in the past; and species which have been designated for special protection or management consideration by state or Federal law. (Append or reference supporting documentation.)

a. List Species/Subspecies	Population (see "c.")	Census date	St. or Fed. status (from "d.")
(1) _____.	_____	_____	____
	_____	_____	
	_____	_____	

Type of Roost (see "b"): _____
Location or distribution of species in cave (see "e"): _____

(2) _____.	_____	_____	____
	_____	_____	
	_____	_____	

Type of Roost (see "b"): _____
Location or distribution of species in cave (see "e"): _____

(3) _____.	_____	_____	____
	_____	_____	
	_____	_____	

Type of Roost (see "b"): _____
Location or distribution of species in cave (see "e"): _____

(4) _____.	_____	_____	____
	_____	_____	
	_____	_____	

Type of Roost (see "b"): _____
Location or distribution of species in cave (see "e"): _____

(5) _____.	_____	_____	____
	_____	_____	
	_____	_____	

Type of Roost (see "b"): _____
Location or distribution of species in cave (see "e"): _____

(6) _____.	_____	_____	____
	_____	_____	
	_____	_____	

Type of Roost (see "b"): _____
Location or distribution of species in cave (see "e"): _____

(Make additional copies of this page as needed)

b. Roost Types:

	Code	Description
(1)	H -	Hibernaculum - used during winter hibernation.
(2)	N -	Nursery - used to rear young.
(3)	S -	Summer/Day Roost - used during summer as resting site.
(4)	T -	Transitory/Migratory - used during seasonal movement of population.
(5)	R -	Night Roost.
(6)	C -	Occasional Use - not used consistently
(7)	O -	Other
(8)	U -	Unknown

c. Population:

If population is estimated prefix number with "E".
If actual census count is used prefix number with "A"

d. State or Federal Species Status

	Code	Description
(1)	FP -	proposed for Federal listing as "Threatened".
(2)	FA -	proposed for Federal listing as "Endangered".
(3)	FC -	candidate for Federal listing as "Threatened".
(4)	FB -	candidate for Federal listing as "Endangered".
(5)	FE -	Federally listed as "Endangered".
(6)	FT -	Federally listed as "Threatened".
(7)	SS -	listed as "sensitive" by state.
(8)	ST -	listed as "threatened" by state.
(9)	SE -	listed as "endangered" by state.
(10)	OO -	other

e. Location and distribution.

	Code	Description
(1)	W -	Widely distributed throughout most of cave.
(2)	G	General distribution in certain areas of cave.
(3)	S	Several isolated locations.
(4)	I	Isolated to single passage or area.

III-D. Paleontological Resources Inventory Checklist

name of cave _____ cave number _____

name of person/group conducting inventory _____ inventory date _____

name of person completing this form if different _____

List all fossil evidence remains or evidence observed or collected during inventory, known to exist due to previous investigations or reports (append or reference supporting documentation). Give all other information requested. When unknown enter "unknown".

1. Invertebrate fossils
   a. name: _____. Age: _____.
      type of remains (see 3a): _____.
      location in cave: _____
      _____
      _____.
      Environmental setting (see 3b): _____.
      Condition (see 3c): _____. Quantities (see 3d): _____.
   b. name: _____. Age: _____.
      type of remains (see 3a): _____.
      location in cave: _____
      _____
      _____.
      Environmental setting (see 3b): _____.
      Condition (see 3c): _____. Quantities (see 3d): _____.
   c. name: _____. Age: _____.
      type of remains (see 3a): _____.
      location in cave: _____
      _____
      _____.
      Environmental setting (see 3b): _____.
      Condition (see 3c): _____. Quantities (see 3d): _____.
   d. name: _____. Age: _____.
      type of remains (see 3a): _____.
      location in cave: _____
      _____
      _____.
      Environmental setting (see 3b): _____.
      Condition (see 3c): _____. Quantities (see 3d): _____.
   e. name: _____. Age: _____.
      type of remains (see 3a): _____.
      location in cave: _____
      _____
      _____.
      Environmental setting (see 3b): _____.
      Condition (see 3c): _____. Quantities (see 3d): _____.

(make additional copies of this form as needed)

2. Vertebrate fossils

a. name: _____. Age: _____.
type of remains (see 3a): _____.
location in cave: _____
_____
_____.
Environmental setting (see 3b): _____.
Condition (see 3c): _____. Quantities (see 3d): _____.

b. name: _____. Age: _____.
type of remains (see 3a): _____.
location in cave: _____
_____
_____.
Environmental setting (see 3b): _____.
Condition (see 3c): _____. Quantities (see 3d): _____.

c. name: _____. Age: _____.
type of remains (see 3a): _____.
location in cave: _____
_____
_____.
Environmental setting (see 3b): _____.
Condition (see 3c): _____. Quantities (see 3d): _____.

d. name: _____. Age: _____.
type of remains (see 3.): _____.
location in cave: _____
_____
_____.
Environmental setting (see 4.): _____.
Condition (see 5.): _____. Quantities (see 6.): _____.

e. name: _____. Age: _____.
type of remains (see 3.): _____.
location in cave: _____
_____
_____.
Environmental setting (see 4.): _____.
Condition (see 5.): _____. Quantities (see 6.): _____.

f. name: _____. Age: _____.
type of remains (see 3.): _____.
location in cave: _____
_____
_____.
Environmental setting (see 4.): _____.
Condition (see 5.): _____. Quantities (see 6.): _____.

g. name: _____. Age: _____.
type of remains (see 3a): _____.
location in cave: _____
_____
_____.
Environmental setting (see 3b): _____.
Condition (see 3c): _____. Quantities (see 3d): _____.

(Make additional copies of this page as needed.)

3. Instructions.
   a. type of remains. This information should include:
      (1) parts of fossil observed or collected. This may be the entire specimen, shell fragment, specific bones, stems, pollen, leaves, and so on.
      (2) method of preservation. This might be freezing, unaltered hard parts, carbon residues, petrification or replacement, casts and molds, or traces (ichnofossils).
   b. environmental setting. Describe the type of geological strata in which fossils are located. This may include:
      (1) exposed or loose on surface of floors.
      (2) within sedimentary deposits
      (3) within amberat (packrat middens)
      (4) exposed in bedrock
   c. Condition. This information will include subjective information concerning:
      (1) the quality of the assemblage and articulation.
      (2) the quality of preservation of both the fossil and its relationship to strata, etc.
   d. Quantities. Quite simply, how extensive are the deposits and how many specimens have been found?

III-D. Mineralogical/Geological Resources Checklist

_____ _____
name of cave cave number

_____
name of person/group conducting inventory _____
inventory date

_____
name of person completing this form if different

Mineralogic and Geologic Features. Enter the type of feature and other information requested. (Refer to 4a-f.)

1. Speleothems/Petromorphs

form (name)	source mineral	/ uniqueness	/ quantity	/ distribution	/ exposure
a. _____					
b. _____					
c. _____					
d. _____					
e. _____					
f. _____					
g. _____					
h. _____					
i. _____					
j. _____					
k. _____					
l. _____					
m. _____					
n. _____					

2. Speleothem Status. Check the following description which best indicates the general status of speleothems throughout the cave.

(a) __ No growth, dry cave, some deterioration of speleothems
(b) __ No growth, but no apparent deterioration of speleothems
(c) __ Isolated areas in cave showing speleothem growth
(d) __ More than 40% of cave with speleothem growth
(e) __ More than 70% of cave with active growth taking place

3. Speleogens. Check those that apply. For uniqueness, exposure and distribution refer to 4a-f.

form name	uniqueness	exposure	distribution
a. __ anastomoses			
b. __ boxwork	NR		
c. __ bridges			
d. __ dome			
e. __ dome pit			
f. __ floor slot			
g. __ flutes			
h. __ joint cavities			
i. __ meander niche			

j. __ meander	—	—	—
k. __ pillar	—	—	—
l. __ rills	—	—	—
m. __ scallops	—	—	—
n. __ spongework	—	—	—
o. __ tepee	—	—	—
p. __ vugs	—	—	—

Explanation of exceptions: _____

_____

_____

_____

_____

_____

_____.

4. Menus and Codes

a. Speleothem/Petromorph Menus.

(1) Primary. Formed during initial creation of volcanic cave and require no entry under "source".

Bubbles/Roses-NR	Clamshells	Driblet Spires
Extrusion Rings-NR	Extrusion Spires-NR	Hornitos-NR
Lavacicles/Pendants	Stalactites	Stalagmites
Other		

(2) Secondary. Formed through mineral deposition after initial creation of cave.

Balloons/Bubbles	Bacon Rind
Bell Canopy	Canopy
Cave Pearls	Cave Velvet-NR
Calcite Roses (Blades)-NR	Cave Cotton-NR
Cave Hair-NR	Coating/Crust
Coralloids	Dogtooth Spar-NR
Draperies	Endellite-NR
Flowers	Flowstone
Folia	Gours
Heligmites	Helictites
Moonmilk	Nailhead Spar-NR
Nitrates/Niter-NR	Needles
Popcorn	Quartz Euhedral Crystals-NR
Rafts	Rimstone Dams
Shelfstone/Tables	Shields
Spathites-NR	Stalactites
Stalagmites	Tabular Gypsum-NR
Pearls	Conulites
Coral Pipes	Blisters
Trees	Other

b. Source Minerals/Rock Menu and codes. Enter the letter code indicating the mineral composition of speleothem/petromorph forms listed under item 1.

A - Aragonite	B - Calcite
C - Epsomite	D - Gypsum
E - Halite	F - Hydromagnesite
G - Ice	H - Basalt/obsedian
I - Limonite	J - Mirabilite
K - Mud	L - Re-solutioned
M - Selenite	N - Sulfate
O - Other	P - Reserved

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c. Uniqueness. Some speleothems, petromorphs and speleogens are considered rare. Rarity may be nationally, regionally or locally. Use the following codes as applicable under 1 and 2.
(1) NR - rare nationally
(2) RR - rare regionally
(3) ST - rare in state
(4) LR - rare locally
(5) CC - common
Those speleothem/petromorph forms listed under the Checklist (see a. above) which are considered rare nationally are already indicated by the code "NR" following the name. Speleogens which are considered nationally rare are already indicated by code.

d. Quantity. Indicate using the code, how common each form is within this particular cave.
(1) Profuse - Pr
(2) Moderate - Md
(3) Uncommon - Uc

e. Distribution. Using the following codes, indicate the general location and distribution of speleothems within the cave.
(1) E - found throughout the entire cave.
(2) S - found in several passages or areas.
(3) L - found in a few large areas.
(4) F - found in a few small areas.
(5) I - found only in a single, isolated passage or area.

f. Exposure. Indicate the vulnerability of features to damage by use, according to location and exposure within passages.
(1) Ex - located in such a manner as to make them extremely difficult to pass by without damage.
(2) Mo - located in such a manner as to make them moderately difficult to pass by without damage.
(3) In - located in such a manner that they can be damaged only intentionally.
(4) Ue located in such a manner as to be extremely difficult or impossible to damage except by unusually effort.
Use the code which applies to most of the cave. If there are specific exceptions to certain areas add an "*" and explain.

III-F. Structural Checklist

_____ _____
name of cave cave number

_____
person/group conducting inventory _____
inventory date

_____
person completing form if different

1. entrances
   a. number known: _____
   b. type (pit, sloping sinkhole, walk in, etc. Describe each seperately): (1) _____
      (2) _____
      (3) _____
      (4) _____

   c. general trend of cave from entrances. Describe each seperately, indicating whether direction was estimated (enter E as a prefix) or a compass bearing, using a true (enter T) or magnetic (enter M) north reading:
      (1) _____
      (2) _____
      (3) _____
      (4) _____

2. passages code
   a. patterns
      (1) single passage/room only S
      (2) pit only/no passages or rooms P
      (3) rectilinear pattern R
      (4) dendritic pattern, bifurcating D
      (5) horizontal maze H
         (a) trellis tH
         (b) spongework (boneyard) bH
         (c) anastomosed network cH
      (6) vertical maze V
      (7) pit with cave passage P
      (8) alcove or rock shelter A
      (9) other O

   b. structural controls/development
      (1) vadose solution
      (2) phreatic solution
      (3) erosion
      (4) faulting
      (5) jointing
      (6) volcanic flow
         i. rift tube ii. surface tube
         iii. trench tube iv. semi trench tube
         v. interior tube vi. primary
         vii. secondary viii. tertiary
         ix. blister x. vent
      (7) other

d. narrative description of general cave passage sizes, shapes, patterns etc: _____

_____

_____

_____

III-G. Obstacles/Risks Checklist

_____ _____
name of cave cave number

_____
person/group conducting inventory _____
inventory date

_____
person completing this form if different

1. Type of Obstacle/Risk Code

a. confusing passageways (describe): _____ C
_____
_____
_____
_____

b. diseases present (give location and description): ____ D
_____
_____
_____

c. gases present (location/description): _____ G
_____
_____
_____

d. loose rock/ice or cave in hazard (location/description): L
_____
_____
_____
_____

c. vertical drops
(1) from 10-100 feet. Number of drops: _____ M
(2) longer than 100 feet. Number of drops: _____ V

d. slippery ice, mud or rock (specify): _____ E
Describe: _____
_____
_____
_____

e. water with no alternate route W
(1) Sumps (describe passage size, length, etc.): _____
_____
_____
_____

(2) Ponds and streams (desribe length, depth, width and airspace): _____
_____
_____
_____

f. poisonous insects and/or reptiles (specify type, location, etc.): _____ P
_____
_____
_____

g. flooding:
(1) seasonal.
(a) Period when cave is generally flooded: _____ F
(b) location and description of areas which flood, escape routes, safe areas, etc.: _____
_____
_____
_____
_____

(1) intermittent (location and description of areas that flood, escape routes, safe areas, etc.): ____ I
_____
_____
_____
_____

h. low temperatures (hypothermia risk) T
_____ degrees (F or C)
i. high temperatures (hyperthermia risk) H
_____ degrees (F or C)
j. tight passages (describe height, width, lengths, etc.): K
_____
_____
_____
_____
k. other O

2. Specialized skill requirements:
a. technical climbing C
b. diving (scuba or air hose) D
c. rapells, ascenders, cable ladders, belays R
d. swimming required wet or dry suit W
e. swimming S
f. good physical condition P
g. other O
h. unknown U

3. Special equipment needs/recommendations (specify): _____
_____
_____

IV. Significance/Difficulty Level Rating Guide

A. Significance Ratings

This section is intended to serve as a guide in establishing management priorities based upon an evaluation of the contents and features of the cave. Using the information obtained from the inventory checklists in Section III, determine the appropriate ratings and enter the rating in "D" of the Master Profile Form (IIA, page 6.)

Please keep in mind that both the evaluation of the significance and value of individual features and the rating asssignment will be based to some extent upon personal judgements and will therefore be somewhat subjective. When in doubt about an appropriate rating, it is generally wise to err in favor of a higher, rather than a lower rating, simply because cave resources are both fragile and nonrenewable.

It is also important to remember that these ratings are for individual features and not the entire cave. In some situations, the overall cave may warrant a higher composite significance rating and create the need for a higher management priority than any of the individual features. For example, a cave may contain no features rated "1" or "2", but it may enough features which are rated "3" or "4" that as an overall composite, the cave could be considered outstanding. In the case of cave resources rated lower than "5", recreational values or outstandingly pristine condition might also warrant a higher priority rating.

The ratings avoid prescriptive recommendations due to the fact that variations in local factors may dictate a variety of management actions and because a cave manager must have the latitude to develop implement management programs customized to specific needs.

The following ratings are based upon the significance of various contents and features. Each rating also considers present status and potential threats to the value of various features. The lower the numerical rating, the more critical the need for management activity. Please note that structural information is not rated.

In those cases where federal law applies, as in the case of endangered species, or cultural resources, the ratings will have been automatically weighted heavily during inventory. In these cases, the reasons are for this automatic weighting are as follows:

1. Cultural sites are considered both extremely sensitive and highly valuable. All cultural sites and materials located on Federal lands are protected under either the National Historic Preservation Act or the Archaeological Resources Protection Act and are subject to specific management mandates. Many states also have similar laws protecting cultural sites on state and privately held lands.

2. Any species which is Federally listed as threatened or endangered is protected by the Federal Endangered Species Act and warrants special management action. Many states also maintain lists of sensitive species. These should also be given high management priority.

For those features not covered under antiquities or species protection statutes the following is intended as a guide in determining the significance of the cave and its features:

1. General Ratings criteria

Significance Rating	Explanation
1	Features of outstanding (or potentially outstanding) significance and/or value which are extremely sensitive and/or vulnerable to damage and/or are immediately threatened.
2	Features of outstanding (or potentially outstanding) significance and/or value which are moderately sensitive and vulnerable to damage and/or are not immediately threatened.
3	Features of unusual or regional significance and/or value which are extremely sensitive and/orvulnerable to damage and/or are immediately threatened.
4	Features of unusual or regional significance and/or value which are moderately sensitive and/or vulnerable to damage and are not immediately threatened.
5	Features of moderate significance and/or value but which are extremely sensitive and vulnerable to damage and/or are immediately threatened.
6	Features of moderate significance and/or value and which are moderately sensitive and/or vulnerable to damage and/or are not immediately threatened.
7	Features of common significance and/or value and which are not easily damaged or vulnerable to damage.

2. Suggested Ratings for Specific Features

a. Cultural Resources. Historical and archaeological resources are usually covered specifically by state and federal laws. All cultural deposits are automatically given a rating of "1" if vulnerable to damage or threatened and "2" if relatively secure from threat of damage.
Caves which are potential sites should be rated "3" until a formal investigation can be conducted.

b. Biological-Potential. If species have not been found in the cave assess the biological potential of the cave using environmental factor information from the inventory guide and checklist (This should be done by qualified personnel).

Use the following assessment criteria to determine appropriate ratings:

Significance Rating	Explanation
3	Cave has potential to support a biotic community but no species are known to be present.
7	Cave has no known biotic community and shows little potential as habitat.

c. Biological-Species present in cave. Using the following criteria when the presence of a biotic community and species have been identified.

1	Species proposed, nominated or listed as sensitive rare, threatened or endangered by state or federal government when extremely sensitive or vulnerable to impact and/or directly threatened.
2	Species proposed, nominated or listed as sensitive rare, threatened or endangered by state or federal government when moderately sensitive or vulnerable to impact and/or not directly threatened.
3	(1) Species proposed, nominated or listed as sensitive rare, threatened or endangered by state or federal government when sensitive or vulnerable to impact and/or directly threatened.
	(2) Cave with high population and/or diversity of known species not listed as sensitive, rare, threatened or endangered by state or federal government but sensitive or vulnerable to impact and/or directly threatened.
	(3) Cave with unidentified species, and when populations, diversity, sensitivity, threat, etc., is unknown.
4	Cave with low population and/or diversity of known species not listed as sensitive, rare, threatened or endangered by state or federal government and/or not sensitive or vulnerable to impact and/or directly threatened.

d. Paleontological Resources. Apply the appropriate rating in accordance with the following criteria:

1	Significant deposits which are extremely vulnerable to damage.
2	Significant deposits which are moderately vulnerable to damage.

3	Extent of deposit is unknown but vulnerable to damage.
4	Extent of deposit is unknown and relatively safe from damage.

e. Mineralogical/Geological Features

Rating	Speleothems, Petromorphs and Speleogens
1	Unique or rare forms in large quantities, distributed throughout the entire cave and which are extremely vulnerable to damage or impact, even by careful users.
2	Unique or rare forms in moderate quantities, or large quantities of common but exceptional forms distributed throughout the entire cave which are vulnerable to damage. or other impacts.
3	Common forms which are relatively safe from damage by careful use.
5	Common forms which would be extremely difficult to damage intentionally or which have already been heavily damaged.

B. Difficulty Level Rating Guide

1. General information.

Difficulty levels are used to communicate to the user and the manager the degree of challenge a cave presents to an average user's physical ability and skills. Difficulty represents cave conditions such as types of passage, water obstacles, temperature, presence of disease, insects or other potentially harmful creatures, crawlway dimensions, and other factors which present an element of risk to users.

Level ratings are only a guide. Those entering a cave should be prepared for all conditions. It is important that the visitor recognize the possibility for changes in environmental conditions which may not be detectable or predictable, such as those which might be present, for example, by a higher than normal water which fills a perviously dry crawlway, or by a poisonous snake which has taken up residence in an entrance since the last inventory.

1. Rating Guide. The following categories are self-explanatory.

Difficulty Level Rating	Explanation
"HIGH"	These are caves with those features which pose the most difficulty or highest risk to users and for which highly specialized equipment, skills, or other precautionary measures would be needed for prudently safe use. Any of the following features would create a "High" difficulty level rating.

1. confusing "maze-type passages
2. the presence of rabies, histoplasmosis or other airborne disease.
3. the presence of methane or other toxic and harmful gases.
4. unstable roofs, walls or other roof which can cannot easily be avoided.
5. vertical drops of more than 100 feet.
6. extremely tight or long crawlways.
7. passages which are subject to flooding from which escape would be extremely difficult or which could trap and drown users.
8. venomous insects or reptiles. which cannot be easily detected or avoided by users.
9. extremely high or low temperatures.
10. Stream sumps, or pools which require total underwater immersion to by-pass.

MODERATE These are caves of moderate difficulty and for which certain equipment, skill levels or other precautionary measures may be needed for prudently safe use. Any of the following factors or features will create a "Moderate" difficulty level rating of "B".

1. Multiple passages or simple "maze-type" passages.
2. Vertical drops of less than 100 feet.
3. Crawls of 6 to 10 feet in length and larger than 10 inches in heighth and width.
4. Unstable roof, wall or rocks which can be easily avoided or by-passed.
5. pools or streams of more than 4 feet in depth which cannot be bypassed or water-filled passage with little airspace.
6. slick floors or slopes.

LOW These are the easiest of caves to explore and generrequire only basic skills and equipment for prudently safe use. General characteristics of a cave with a "Low" Difficulty Level rating would, in addition to the lack of features included under caves rated "High" or "Moderate", include:

1. well-defined passages with simple lateral or "maze type" passage.
2. no vertical drops of more than six feet for which there is no obvious bypass.
3. stable roof, walls and other rock.
4. crawlways which are short and not smaller than 24 inches in diameter.

APPENDIX A

Partial list of species which may be found in a cave. From the New Mexico BLM Cave Inventory and Classification System. Codes are for computer application.

UN - Unknown Amphipods
UC - Unknown Copepods
UI - Unknown Isopods

MP - Millipedes
CP - Centipedes

UB - Unknown Beetle
RB - Rhadine Beetle
FB - Round Fugus Beetle
SB - Scavenger Beetle
DB - Darking Beetle
EB - Eleodes Beetle

OB - Rove Beetle
EB - Embacphion Beetle
IB - Diving Beetle
GB - Ground Beetle
LB - Flat Back Beetle

UB - Unknown Cricket
CL - Ceuthophilus Longipes
CA - Ceuthophilus Carsbadensis
CO - Ceuthophilus Conicaudus

SP - Springtails
DI - Diplurons
FL - Flies
FE - Fleas

BF - Bat Flys
LI - Lice
AT - Ants
BT - Bristletails
CE - Collemboa

MO - Moths

FW - Flat Worms
UW - Unknown Worms
TW - Tubeifax Worms

UA - Unknown Arachnid
HA - Harvestmen
SR - Spiders
MI - Mites

SC - Scorpions
TI - Ticks
PS - Pseudoscorpions
SI - Spiders

UL - Unknown larva

Prescriptions for Cave Management

by James Nieland

Abstract

Introduction

Until recently few land managers considered caves to be a resource. Many thought of them as a nuisance, a place for someone to get lost or hurt in, or a place for locals to dump their trash. They were thought of as just "holes in the ground"; places of no earthly value. After all, you can't grow trees or grass underground. Besides, everyone knows that they are dark nasty places infested with bats and that bats are rabid and suck your blood. Only a crazy person would venture into a place like that!

I am happy to report that the tide of knowledge is turning and that caves are starting to be recognized as the valuable resources they are. Still many land managers have little understanding of specific cave values or the ways in which logging, mining, grazing, road construction, or uncontrolled recreational use can impact them. Management prescriptions are useful in identifying potential impacts before they occur and as a tool to foster better understanding of cave management concerns.

Abuses

Examining a few examples of past abuses is instructive when looking for ways to improve cave management. In most cases, it is unlikely that the land manager held a vengence toward the caves which were impacted by the management activity. More than likely a lack of understanding of the values involved or the significance of the impacts lead to the damage.

Deadhorse Cave is a lava tube which contains an unusual and unique ecosystem. Tree roots extending through the ceiling provide a major nutrient source for cave invertebrates. Running water, rare in lava tubes, contains isopods, flatworms and mites. The cave has been recognized internationally for its biota.

In the mid 1960's, roads were built and the forest overlying the cave was selectively logged, reducing available nutrients in the cave. In the mid 1970's, the cave area was destined for clearcut logging and it was only through the intervention of a group of interested scientists that the logging was stopped. The 1960's logging had another impact upon the cave. Woody debris from road construction was piled in one entrance for burning. The wood burned well, aided by a strong draft from the cave entrance below the pile. Luckily the smoke was not drawn into the cave which probably would have spelled disaster for its inhabitants.

Roadside Cave is a small cave which was broken into during road construction. The cave could have easily been avoided by a slight realignment of the road but a decision was made to cut

through it. Additionally, the cave was found to provide a convenient drain for ditch water originating along the road. Road oil and sediment have since been washing into the cave

Candle and Ashers caves have had all timber removed from their entrances which isolated them in the middle of a clearcut. Broadcast burning of logging slash occurred over the caves and in their entrances significantly altering entrance microclimates and nutrient flow into the caves. The caves were not known to speleologists prior to the logging but it evidence indicates that a significant bat population was affected.

Recreational use creates the single greatest impact on caves. At one time, many Northwestern caves contained drip-eroded deposits of volcanic sand and ash known as sand castles. These deposits frequently took on the form of a miniature badlands of towers, ridges, holes, and pools. These delicate features were no stronger than the sand from which they formed. Sand castles are now a rare feature found in only a few caves and have become so entirely due to unrestricted recreational visitation and its resultant trampelling.

Bats have a very low tolerance to disturbance during the time of year that they are in hibernation. Recreational use of bat caves has resulted in drastic declines in populations across the country causing some species to be threatened by extinction. Some species can withstand no disturbance while others can withstand only one or two disturbances per winter before starvation sets in.

Most damage caused to caves by other land use management activities is unintentional and usually results from a lack of understanding of cave values or the impacts which projects may cause. A need exists to identify and nullify potential impacts before they occur. Management prescriptions can be used as a tool to both identify potential impacts and to acquaint land managers with some of the special concerns which should be considered.

Management Prescriptions

Management prescriptions are "cookbook" like lists which describe the types of do's and don'ts which should be considered when caves are encountered in project areas. They consist of two basic types of management direction: general and specific.

General direction is used to identify basic goals and procedures which should be followed whenever caves are encountered in a project area. General direction can discuss inventory, interim protection, or philosophies of protecting the cave resource.

Specific direction is categorized by management activity and identifies the specific types of impacts common to the activities.

Example Prescription

Presented below is an example of a cave management prescription developed for use in the forest management plan of the Gifford Pinchot National Forest. Specific impacts and concerns are developed in response to conditions found locally. They should not be considered necessarily appropriate for other areas which may have differing management activities or intensities of use. Specific prescriptions must be developed for use in the management area in which they are to be used.

Caves

General Direction

Caves are a resource having unique scientific, recreational, educational, cultural, and scenic values. These values can be endangered by resource management activities or in some instances by uncontrolled recreational use. When caves are encountered in project areas, they will be preserved in as nearly as possible an undisturbed condition until an inventory or their values is completed and a plan for their management written. The inventory should be conducted and the plan written by persons knowledgeable in speleology.

A plan must address the goals of cave protection while permitting compatable uses.

The following elements will be considered when an inventory is conducted:

1. A resource inventory of the cave should commence with inquiries to local caving organizations and cave scientists and a search for relevent information in published literature.

2. Inventory takers should consider all possible values of a cave, whether scientific (including geological, archaeological, biological, paleontological, etc.) scenic or recreational.

3. Some aspects of a cave's value may be seasonal in nature (e.g., ice speleothems or seasonal fauna such as bats); therefore, when possible, inventory should include visits at more than one time of year.

4. Biological inventory must recognize that small and inconspicuous invertebrate animals contribute a large part to a cave's biological importance and should also consider the often unusual plant communities in cave entrances.

5. Inventory must consider a cave's interaction with its surface and subsurface surroundings.

Timber

Cave roofs can be thin and present a hazard to equipment and operators. This may restrict logging methods and techniques used over caves or restrict methods of slash disposal.

Cave entrances should not be used as disposal sites for slash, refuse, spoils, etc.

Alterations to entrances will be avoided as a part of timber harvest activities.

Nutrient flow into cave ecosystems can be affected by surface modifications over cave passages or on lands near cave entrances, including logging and slash disposal. Generally slash should not be burned or the ground significantly disturbed within the runoff area draining into cave entrances.

Slash burning that has the potential of sterilizing thin soils overlying cave passages should be carefully considered before the project is undertaken to determine its effects.

In some instances, it may be necessary to leave vegetative buffer areas around cave entrances to protect their microenvironments or over cave passages to protect the cave's biota.

In cases where it is permissible to cut timber within or adjacent to cave entrance areas, timber should be directionally felled away from the entrances and slash disposed of by hand methods.

Roads

Generally, roads should be located away from cave entrances and avoid crossing over the cave's course. No alterations to cave entrances will be made.

1. Road construction will not interfere with natural cave hydrology.

2. Cave roofs can be structurally unstable and may in some cases be unable to support roads.

3. By locating roads away from cave entrances, increased visitation and its resulting impacts can be reduced.

Wildlife

Some caves contain unique and fragile biologic communities which require protection. The following considerations will help preserve these values.

1. Maintain the integrity of the cave and its surroundings.

2. Preserve vegetation at entrances and over the course of the cave where needed.

3. Protect water quality.

4. Sensitive wildlife (e.g. bats, etc.) should be protected by minimizing human disturbance during sensitive periods.

5. The use of pesticides, herbicides, fertilizers and other chemicals which could cause adverse impacts to cave life should be avoided in the hydrologic setting of the cave.

6. Human impacts should be minimized through a combination of educational programs and restricted access to sensitive caves.

Recreation

Caves provide a variety of recreational opportunities but not all caves are suitable for recreational use. Caves generally are not overly hazardous but exceptions do exist for ill prepared or untrained individuals. Care should be taken to avoid directing recreational traffic to sensitive or hazardous caves.

Certain caves, cave entrances, or vicinities may be suitable for one or more levels of recreational activity (e.g. picnicing, sightseeing, or cave exploring) or development. Generally, development should be limited to caves which have a history of heavy use and whose development will not detract from the cave's values. Recreational use if allowed to take place in an uncontrolled manner, can create severe impacts in sensitive caves. If conflicts arise, consideration should be given first to protecting the cave's values and secondarily providing a variety of recreational opportunities.

Caves meeting the following criteria are generally unsuitable for directed or unrestricted recreational use:

1. Caves under scientific study where recreational use could be detrimental to the studies.

2. Caves containing sensitive or endangered species.

3. Caves containing delicate geologic or other features which could be easily damaged.

4. Caves requiring special technical skills or equipment to explore. This should not limit persons possessing necessary skills from access to these caves.

5. Caves containing significant cultural resources or paleontological values.

Would-be cave explorers should be educated in cave conservation and in safe cave exploration practices where opportunities are found. Persons seeking cave information can be directed to appropriate local caving oganizations.

Developed Recreation Sites

Caves should be developed for public use only when they can be properly interpreted and protected and should be utilized as an educational opportunity. Development should be considered when it would be beneficial in protecting the resource.

When development takes place, care should be taken to minimize the impact. Cave development should be carried out using established cave management techniques.

The following management or development elements will need to be considered:

1. Access road and parking area location.

2. Sanitation and sewage disposal.

3. Visual quality.

4. Trail placement and design.

5. Lighting design.

6. Protection of delicate features.

7. Carrying capacity.

8. Managing the public.

9. Development of interpretive programs.

10. Maintenance.

Dispersed Recreation

The thrill of discovering and exploring wild caves is a vital recreational experience. The following will help maintain this value:

1. Limit the publication of cave locations to those which are developed sites.

2. References to wild caves and wild cave locations should generally be omitted from publications prepared for widespread public distribution.

3. Trail or road signs should be not direct public attention to wild caves.

4. By locating roads and trails away from cave entrances, increased visitation and its impacts can be minimized.

Mining

Mining is inappropriate in or around caves when a cave's value will be affected. Removal or speleothems, rock slabs, sand, or other features should not be permitted. Development of borrow pits, quarries or other excavations shall be done in such a manner as to cause runoff or sediment to enter caves.

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Next Issue

Volume 1, Number 2 of the ACCA Cave Management Series is scheduled for publication in April 1986. It will feature "Information and Education in Cave Management", by Phil Whitfield, cave management specialist with the British Columbia Provincial Parks in Canada and "Cave Gate Design Considerations" by Jim Hathorn, director of the National Speleological Society's task forces program.

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